CLAIMS

1. A projection display screen having a diffusion film for diffusing light incoming from an angular range of diffusion of an incident light into an angular range of diffusion of an outgoing light, wherein the diffusion film comprises a structure in which a plurality of layers, each of which has a different refractive index from the adjacent layers, constituting a plurality of optical waveguides of a step index type forms stripes arranged in the banded state in a direction in a film plane and extends in the direction of the layer inclination angle distributed substantially in a top hat shape within a predetermined angular range with respect to the direction of the film thickness.

2. A projection display screen having a diffusion film for diffusing light incoming from an angular range of diffusion of an incident light into an angular range of diffusion of an outgoing light, wherein the diffusion film comprises a structure in which a plurality of layers, each of which has a different refractive index from the adjacent layers, constituting a plurality of optical waveguides of a step index type forms stripes arranged in the banded state in a direction in a film plane, one or more peaks are included within a predetermined angular range with respect to the direction of the film thickness, and the plurality of

layers extends in the direction of the layer inclination angle distributed substantially in a top hat shape excepting said peaks excepting said peaks within the angular range.

3. The projection display screen according to Claim 1 or 2, wherein the structure of the diffusion film includes a film thickness L and a maximum value of the width of the strip y_{max} which satisfy the following expression:

$$L \geq 10 \times y_{max}$$

4. A projection display screen having a diffusion film for diffusing light incoming from an angular range of diffusion of an incident light into an angular range of diffusion of an outgoing light, wherein the diffusion film comprises a structure in which a plurality of layers constituting optical wave guides having a refractive index distribution that brings out a light-collecting property in the direction of the layer thickness extends in the direction of the film thickness or in the direction inclined from this direction with a layer length distributed within a predetermined range substantially in the top hat shape in a portion in the direction of the film thickness.

5. A projection display screen according to Claim 4, wherein the structure of the diffusion film has the

refractive index distribution of the optical waveguides is of a gradient index type, and a layer inclination angle θ, a maximum value L_{zmax} and a minimum value L_{zmin} of the layer length, and a pitch P of the optical waveguides satisfy the following expression;

$$L_{zmax} - L_{zmin} \geq (P/2) \times \cos\theta$$

6. A projection display screen having a diffusion film for diffusing light incoming from an angular range of diffusion of an incident light into an angular range of diffusion of an outgoing light, wherein the diffusion film comprises a structure in which a portion having the same structure as the diffusion film according to any one of Claims 1 to 3 and a portion having the same structure as the diffusion film according to Claim 4 or 5 are mixed in the direction of the film thickness or in the direction in the film plane.

7. A projection display screen having a diffusion film for diffusing light incoming from an angular range of diffusion of an incident light into an angular range of diffusion of an outgoing light, wherein the diffusion film comprises a structure in which the structure of the diffusion film according to any one of Claims 1 to 3 and the structure of the diffusion film according to Claim 4 or 5

are fused with each other.

8. A screen using a film having a function of converting a light-outgoing direction comprising: a diffusion film for diffusing light incoming from an angular range of diffusion of the incident light into an angular range of diffusion of an outgoing light; and a light-outgoing direction converting film for causing light incoming from an oblique direction to go out toward the front, wherein the light-outgoing direction converting film comprises a structure in which a plurality of layers, each of which has a different reflective index from the adjacent layers, forming a plurality of step index type optical waveguides is arranged in a banded state in the direction in a film plane, and extends so as to be bent with respect to the direction of the film thickness.

9. A screen using a film having a function of converting a light-outgoing direction comprising: a diffusion film for diffusing light incoming from an angular range of diffusion of the incident light into an angular range of diffusion of an outgoing light; and a light-outgoing direction converting film for causing light incoming from an oblique direction to go out toward the front, wherein the light-outgoing direction converting film

comprises a structure in which a plurality of layers forming optical waveguides having a distribution of refractive indexes which brings out a light-collecting property in the direction of the layer thickness is arranged in a banded state in the direction in a film plane, and extend so as to be bent with respect to the direction of the film thickness.

10. A screen using a film having a function of converting a light-outgoing direction comprising: a diffusion film for diffusing light incoming from an angular range of diffusion of the incident light into an angular range of diffusion of an outgoing light; and a light-outgoing direction converting film for causing light incoming from an oblique direction to go out toward the front, wherein the light-outgoing direction converting film comprises a structure in which the structure according to Claim 8 and the structure according to Claim 9 are mixed in one or both of the film thickness direction and in the direction in the film plane.

11. A screen using a film having a function of converting a light-outgoing direction according to any one of Claims 8 to 10, wherein the angular range of diffusion of the incident light of the diffusing film matches the outgoing angular range of the light-outgoing direction

converting film.

12. A screen having a light-outgoing direction converting/diffusing film that causes incident light from an oblique direction to diffuse and go out toward the front direction, wherein the light-outgoing direction converting/diffusing film comprises a structure in which a plurality of layers, each of which has different refractive index from the adjacent layers, and forming a plurality of step index type optical waveguides is arranged in a banded state in the direction in a film plane, and extends so as to be bent with respect to the direction of the film thickness, and layer inclination angles are distributed substantially in a top hat shape.

13. A screen having a light-outgoing direction converting/diffusing film that causes incident light from an oblique direction to diffuse and go out toward the front direction, wherein the light-outgoing direction converting/diffusing film comprises a structure in which a plurality of layers forming optical waveguides having a distribution of refractive indexes which brings out a light-collecting property in the direction of the layer thickness is arranged in a banded state in the direction in a film plane, and extends so as to be bent with respect to the

direction of the film thickness, and the length of the layers are distributed substantially in a top hat shape.

14. A screen having a light-outgoing direction converting/diffusing film that causes incident light from an oblique direction to diffuse and go out toward the front direction, wherein the light-outgoing direction converting/diffusing film comprises a structure in which the structure according to Claim 12 and the structure according to Claim 13 are mixed in one or both of the film thickness direction and in the direction of the film plane, or a structure in which the structure according to Claim 12 and the structure according to Claim 13 are fused with each other.

15. An optical system for projection display system comprising: a screen using a film having a function of converting a light-outgoing direction according to any one of Claims 8 to 14; a projector which emits an incident light to the screen, wherein a projector aperture and arrangement of the projector matches an angular range of incidence of the screen.

16. The optical system employing projection display system according to Claim 15, further comprising a

reflection mirror which reflects the emitted light from the projector and causes the same to enter the screen, wherein the arrangement of the reflection mirror matches the angular range of incidence of the screen.